PERSPECTIVES PAPER

Global Water Partnership

Beyond increasing block tariffs

– Decoupling water charges from the provision of financial assistance to poor households

Increasing block tariff (IBT) regimes are widely used as a means to charge for access to water services. These tariff structures have been justified based on the claim that they make piped water services more affordable for poor households. This paper finds that IBT regimes fail the most basic of inclusive development tests.

The use of IBTs to charge for piped water services assumes that the correlation between household income and water use is high. This is rarely the case.

Poorer households will be better off when (i) they are provided with financial assistance using separate policy instruments, (ii) all households have metered connections to a piped water network, and (iii) all water users are required to pay the full cost of service provision.

It may be time to transfer responsibility for ensuring that access to water is affordable to agencies that specialise in financial assistance to poor and disadvantaged people. Water utilities could then be assigned full responsibility for the supply of water services to all people.

This Perspectives Paper was prepared by Mike Young and Dale Whittington, GWP Technical Committee members. It is intended to galvanise discussion within the network and the larger water and development community. Please engage in the discussion by sending your comments by email to **paperontariffs@gwp.org**.

About Global Water Partnership

The Global Water Partnership (GWP) vision is for a water secure world.

Our mission is to advance governance and management of water resources for sustainable and equitable development.

GWP is an international network that was created in 1996 to foster the application of integrated water resources management: the coordinated development and management of water, land, and related resources in order to maximise economic and social welfare without compromising the sustainability of ecosystems and the environment.

The Network is open to all organisations which recognise the principles of integrated water resources management endorsed by the Network. It includes states, government institutions (national, regional, and local), intergovernmental organisations, international and national non-governmental organisations, academic and research institutions, private sector companies, and service providers in the public sector.

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Photos: MostPhotos

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Foreword

When I read this paper, I found it to be stimulating and thought provoking. The paper raises important questions concerning access to piped water services, especially for the poor. As such, it could have ramifications for how communities and countries reach the water supply objectives of Sustainable Development Goal 6 and the 2030 Agenda.

This paper also has important implications for the issues of transparency in the administration of water supply and possibly the human right to water. It is possible that many well-intended water-pricing regimes have perverse effects on opportunities for inclusive development and the provision of comprehensive access to piped water and sewage services.

The authors argue that the provision of financial assistance to poor households should be decoupled from the regimes used to signal the full cost of supplying water services to users and providing full coverage. By doing so, benefits will flow to all from the resultant increase in utility capacity to supply reliable full coverage, from the wiser use of water, and the more effective targeting of assistance.

There may be exceptions to the general finding of this paper; nevertheless, it recommends that water utilities using increasing block tariffs (IBTs) survey their users to determine the relationship between household water use and income in their city. The authors predict that most of these utilities will find the correlation between water use and income to be positive but low. This should lead them to the conclusion that their IBT regime does not target assistance to poorer households. Poor subsidy targeting will be an especially serious problem in locations where water services are heavily subsidised.

The authors have asked me to thank the GWP Technical Committee for valuable comments and the GWP Secretariat for editorial and publishing support. Responsibility for the paper's content remains with the authors.

Dr Jerry Delli Priscoli
Chair of GWP Technical Committee

"Our world has a grave social debt towards the poor who lack access to drinking water, because they are denied the right to a life consistent with their inalienable dignity. This debt can be paid partly by an increase in funding to provide clean water and sanitary services among the poor."

Pope Francis, 2015

"Access to safe drinking water, sanitation and hygiene represent some of the highest development priorities of countries worldwide. These are also important human rights issues."

UN Secretary-General Ban Ki-moon, 2014

1 Introduction

The statements by Pope Francis and Ban Ki-moon highlight the importance that international leaders give to the provision of affordable access to water and sanitation services. Government policy positions on the best way to provide access to and finance delivery of water services vary. The main financial mechanism used to provide equitable access to water is an increasing block tariff (IBT). Typical IBT pricing regimes supply the first tranche of water purchased at a very low price. The second and subsequent tranches are offered at successively higher prices. Use of IBTs is widespread (Figure 1) and reported to be increasing (Eaton, 2015).

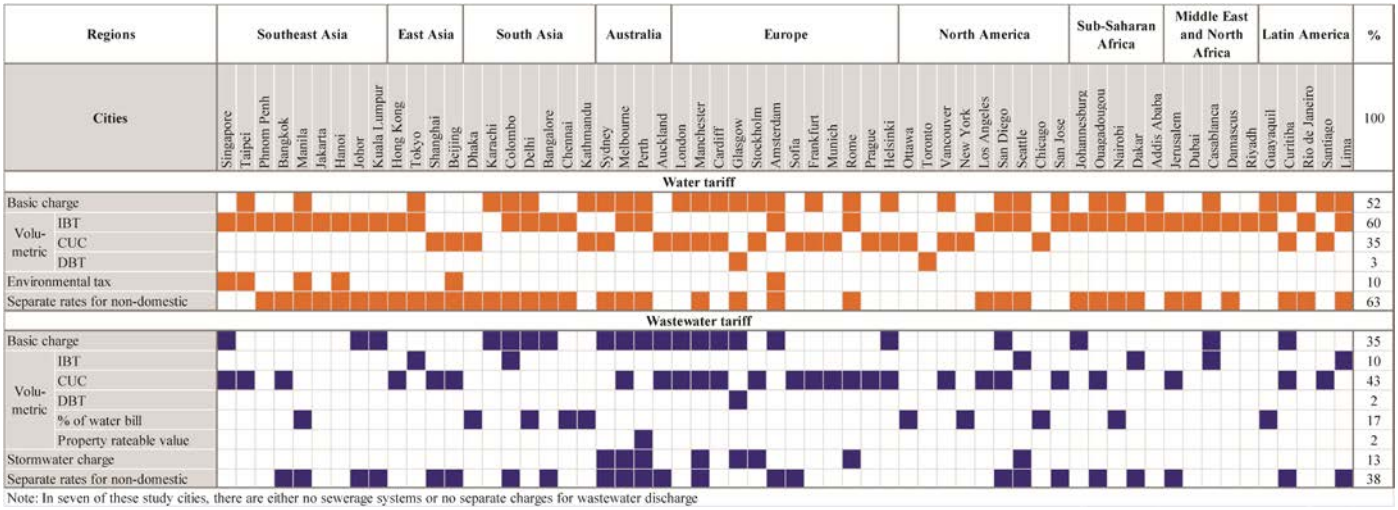
International Monetary Fund staff estimated that in 2012 there was US$456 billion – 0.6% of global gross domestic product (GDP) – spent on subsidising water utilities. In developing Asia, the percentage of GDP spent on subsidies to water utilities is nearly three times higher (1.6% of regional GDP). In seven countries,[1] subsidies amount to more than 5% of GDP (Kochhar et al., 2015).

In this paper, we focus on the most appropriate way to allocate such subsidies, not the question of how large these subsidies should be. Pragmatically, we limit our discussion to the provision of urban water and sanitation services to households that are connected to a piped water and sewage system. Consideration of the most appropriate way to provide water to communities with irrigation schemes, to industry, and to households with unmetered connections is left to others.

In a recent report, International Monetary Fund staff (Kochhar et al., 2015) concluded that

"Getting incentives right, notably by reforming water pricing, can help rationalize water use, promote investment and protect the poor. Water subsidies provided through public utilities are … inequitable, disproportionately benefiting upper income groups."

Figure 1 Components of water and wastewater tariff structures implemented in 60 selected cities



Increasing Block Tariff (IBT); Constant Uniform Charge (CUC); and Decreasing Block Tariff (DBT).

Source: Adapted from Hoque and Wichelns (2013).

[1] Azerbaijan, Honduras, Kyrgyz Republic, Mongolia, Tajikistan, Uzbekistan, and Zimbabwe.

2 Goals and objectives

In the case of the provision of urban water and sanitation services, there are at least five policy goals of water service managers and government leaders:

1. **Full coverage (access for all)** – a system that makes potable water and adequate sanitation services available to all on a reliable 24/7 basis.
2. **Affordability** – pricing policies do not discourage people from connecting and using water and sanitation services.
3. **Economic efficiency** – at the margin, investment in **both water production** infrastructure, its operation, and **water use** – consumers consider the marginal cost of supplying and maintaining these services when they make decisions about how much water to use, and water utilities consider the costs of their inputs to produce water services compared to the revenues they receive from customers.[2]
4. **Revenue sufficiency** – charges are sufficient to enable the efficient maintenance and expansion of the infrastructure needed to provide full coverage as populations grow and demand changes.
5. **Inclusive development** – any redistribution of income favours poor and/or opens up opportunities for disadvantaged people.

As observed earlier, IBTs are justified primarily because of their claimed ability to deliver an essential minimum amount of water to users at an affordable price.

3 Theory

When multiple goals and objectives are involved, as is the case with the provision of water and wastewater services, it is useful to consider the Tinbergen Principle,[3] which states that, when pursuing multiple objectives, the probability of finding a dynamically efficient solution is greater when a separate financial instrument is used to pursue each policy objective.

'Dynamic efficiency' refers to the idea that resource use will be efficient across space and through time as conditions change (Tinbergen, 1952). When separate instruments are used, cost-effective trade-offs between objectives can be made as conditions change. Building upon this principle, in this paper we develop the proposition that when supplying water and sanitation services it is both more efficient and more equitable to set a uniform volumetric charge and, where appropriate, provide financial assistance to those who cannot afford access using a separate financial instrument.

Compliance with the Tinbergen Principle requires water utilities to charge for the provision of water supply and sanitation services at their full cost[4] and then either use a separate rebate or other arrangement to assist disadvantaged households and/or leave provision of financial assistance to others.

In the economic literature, this approach is known as decoupling. Decoupled fiscal arrangements enable one set of policy instruments to be used to encourage efficient water use and production and cost recovery. When users are required to pay the full cost of water use, it becomes possible for a water utility to borrow the money needed to expand networks as populations expand and per capita demand increases. For this to occur without compromising inclusive development and affordability objectives, however, it is necessary for a separate mechanism to be used to provide financial assistance to poor households that cannot afford to pay their water bill.

Decoupled arrangements for water supply, however, are rarely used – even though most economic studies

[2] In some urban areas, in particular, where populations are in decline, water supply infrastructure and raw water supplies both can be in surplus. In these situations, short-run marginal cost pricing is needed. Account also needs to be taken of monopoly supply considerations, which can create situations where marginal cost is less than average cost and where it may be appropriate to charge volumetric rates below average costs and use positive fixed charges to achieve cost recovery. It may also be appropriate to build surplus capacity in the expectation that demand will increase. These considerations, however, are not the focus of this paper.

[3] Jan Tinbergen, the man who first proposed this principle, was the first person to receive the Nobel Prize in Economics, in 1969. He first published the proposition that in order to achieve dynamic efficiency there should be as many instruments as policy goals in 1952.

[4] See footnote 3.

show that the majority of the benefits from existing IBT regimes go to wealthier households.[5]

4 Increasing block tariffs

IBTs have broad political appeal because they make some water available to all households at much less than the full cost of supply. Everyone, so it is said, benefits because they get the water they require to meet essential needs at a subsidised price, but in fact the size of the lifeline block is not adjusted for household size. Others argue that IBTs are fair because they force wealthier households to contribute towards the cost of providing subsidised services to poorer households.

Typically, the first block of water in an IBT is supplied at a very low price and the next block at a higher price and so on. In much of the water resources literature, it is assumed that high water-using households are paying close to or more than the marginal cost of supply including capital and operation and maintenance costs, and the opportunity cost of sourcing the water. In practice, however, there are almost no examples of developing country tariff regimes where urban users pay the average cost of supply.[6] IBTs are common in developing and developed countries. Some international examples of the pricing of the first block of water in IBT schemes follow:

1. In South Africa, access to the first block is often supplied at no charge (Muller, 2013).
2. In Sri Lanka, the first block is supplied at US$0.04 per cubic metre (Water Board, 2012).
3. In contrast, in Adelaide, Australia, the first block is supplied at US$1.75 per cubic metre.[7]

There are alternative approaches. In Chilean cities, for example, disadvantaged people are invited to apply to the government for assistance (see Box 1).

Many IBT regimes also include a fixed charge that is set to cover some or all of the fixed costs associated with service delivery.

Box 1 Water charging in Chile

In Chile, most water supply and sanitation systems are operated through a company and financed almost entirely through revenues collected from users. Rather than subsidising access to water, the Chilean Government offers means-tested financial assistance to households who, without financial assistance, would spend more than 5% of their income on water.

Any household that expects to spend more than 5% of household income on water can apply for financial assistance and, when their application is successful, the government pays part of their water bill.

The Chilean water pricing regulator is then left to set tariffs in a manner that sends clear economic signals about the cost of water supply and treatment and, also, the cost of securing access to and maintaining the supply system.

Freed from the need to subsidise water use, Chilean water utilities are able to finance maintenance, etc. from the revenue they receive.

While there is room for improvement in the targeting mechanisms used, reviews show that mechanisms similar to those used in Chile tend to be more efficient and outcomes more equitable than those being achieved in comparable countries like Peru where IBT regimes are used.

Sources: Barde and Lehmann (2014); Bitran and Arellano (2005); Gómez-Lobo and Contreras (2003); Hearne and Donoso (2005); Williams and Carriger (2006).

[5] See for example, Angel-Urdinola and Wodon (2007); Angel-Urdinola and Wodon (2012); Bardasi and Wodon (2008); Barde and Lehmann (2014); Boland and Whittington (2000); Diakité et al. (2009); Gómez-Lobo and Contreras (2003); Komives et al. (2005); Ruijs (2009); Whittington (1992); and Whittington et al. (2015).

[6] We think that in developing countries the full average cost of water supply is rarely less than US$1.00 per cubic metre. The cost of supplying sewage services is typically in the order of 25–50% higher than piped water services (Whittington et al., 2009).

[7] For more data, see the IBNET Water Supply and Sanitation Blue Book 2014: The International Benchmarking Network for Water and Sanitation Utilities Databook. Available at https://openknowledge.worldbank.org/handle/10986/19811

Table 1 provides an overview of a relatively complicated IBT regime used in a country in Asia whose identity we prefer to keep confidential. Our purpose is to illustrate how the regime works, not to select one group of water managers out for criticism. There are ten blocks and a positive fixed charge, the size of which varies by block. Reliable data on the average cost of water supply in this regime are lacking, so it is assumed that it is in the vicinity of US$1.00 per cubic metre. When these data are reviewed, it is clear that most households in this country pay much less than the full cost for all the services they receive.

As is the case with most IBT regimes, in the regime portrayed in Table 1, the greatest financial benefit goes to households that use large amounts of water and use by every user is subsidised. That is, the regime does not provide the greatest benefit to those who, because they cannot afford to pay for water, only use a relatively small quantity. Those households that use small amounts of water do receive some subsidies, but only around US$50 annually – around one-fifth of the financial assistance available to higher water-using households that use large amounts of water. If poor households used large amounts of water and richer households used only a small volume the regime would pass an inclusive development test.

As an aside and from an energy (and carbon) perspective, it is interesting to note that one cubic metre of water weighs one tonne (1,000 kilograms). When water use charges are used to redistribute income, massive weights need to be moved to deliver a small relatively small financial benefit. Around 480 tonnes of water, for example, need to be moved to deliver US$251 of annual monetary benefit.[8] That is, the currency used to deliver financial assistance weighs around US$2 per tonne. As a general rule, there are much more cost-effective ways to provide financial assistance. Moreover, as greenhouse gas emissions are an important global concern and the provision of water services uses large amounts of energy, the use of a heavy resource, like water, to transfer income from one person to another imposes unnecessary global warming costs on society.

Table 1 An example of a ten-block IBT regime used in a developing country

Household consumption m^3/month)	Volumetric charge (US$/$m^3$)	Service fee (US$/ month)	Total annual cost of supplying water service (US$)	Value of annual subsidy (annual payment less cost of supply) (US$)	Subsidy per m^3 as % of cost of supply
(A)	(B)	(C)	(A)x(B) + (C)x12		
0–5	0.04	0.38	60.00	53.04	88
6–10	0.08	0.38	100.00	108.24	90
11–15	0.11	0.38	180.00	161.64	90
16–20	0.30	0.60	240.00	201.00	84
21–25	0.44	0.75	300.00	232.80	78
26–30	0.66	1.50	360.00	244.20	68
31–40	0.79	3.00	480.00	251.40	52
41–50	0.90	4.88	600.00	240.84	40
51–75	0.98	7.50	900.00	215.40	24
Over 75	1.05	12.00			

Source: Available from the authors on request.

[8] 40 m^3 per month for 12 months = 480 m^3. One m^3 of water weighs one tonne.

5 Affordability

There appears to be global recognition that the cost of access to safe water and adequate sanitation should not exceed 5% of household income. This 5% guideline has been stated repeatedly in various United Nations reports (e.g. UNDP, 2006) and adopted in countries as different from one another as South Africa, Chile, and the United States. Throughout the world, however, very few households pay more than 5% of their income for piped water and sanitation services. Affordability is rarely a problem for households with a private connection.

This situation, however, is quite different for households without access to a reliable piped water supply. These households must either pay high prices to a water vendor or cart it themselves from a standpipe or similar source. In slum districts, typically, water sourced from water carts is much more expensive than that obtainable from the public piped water supply system. In Nairobi, water from a cart is reported to be 20–25 times the average price of water sold by the public provider. Similar situations exist in Jakarta and many other cities where average incomes are low (Fournier et al., 2013). When financially disadvantaged households are not connected to a piped network, they are forced to pay much higher prices than would be the case if they were provided access to water services at full cost.

6 Household water use and income

The use of volumetric water charges as a means to redistribute income relies on the extent of the correlation between income and water use. If the following apply:

- the correlation between household income and water use is high,
- the price of water in the upper blocks of an IBT is significantly above the average supply cost, and
- a large proportion of the water provided by a utility is charged at the price in the upper blocks,

then IBT regimes could be used to redistribute income from high to low water-consuming households.

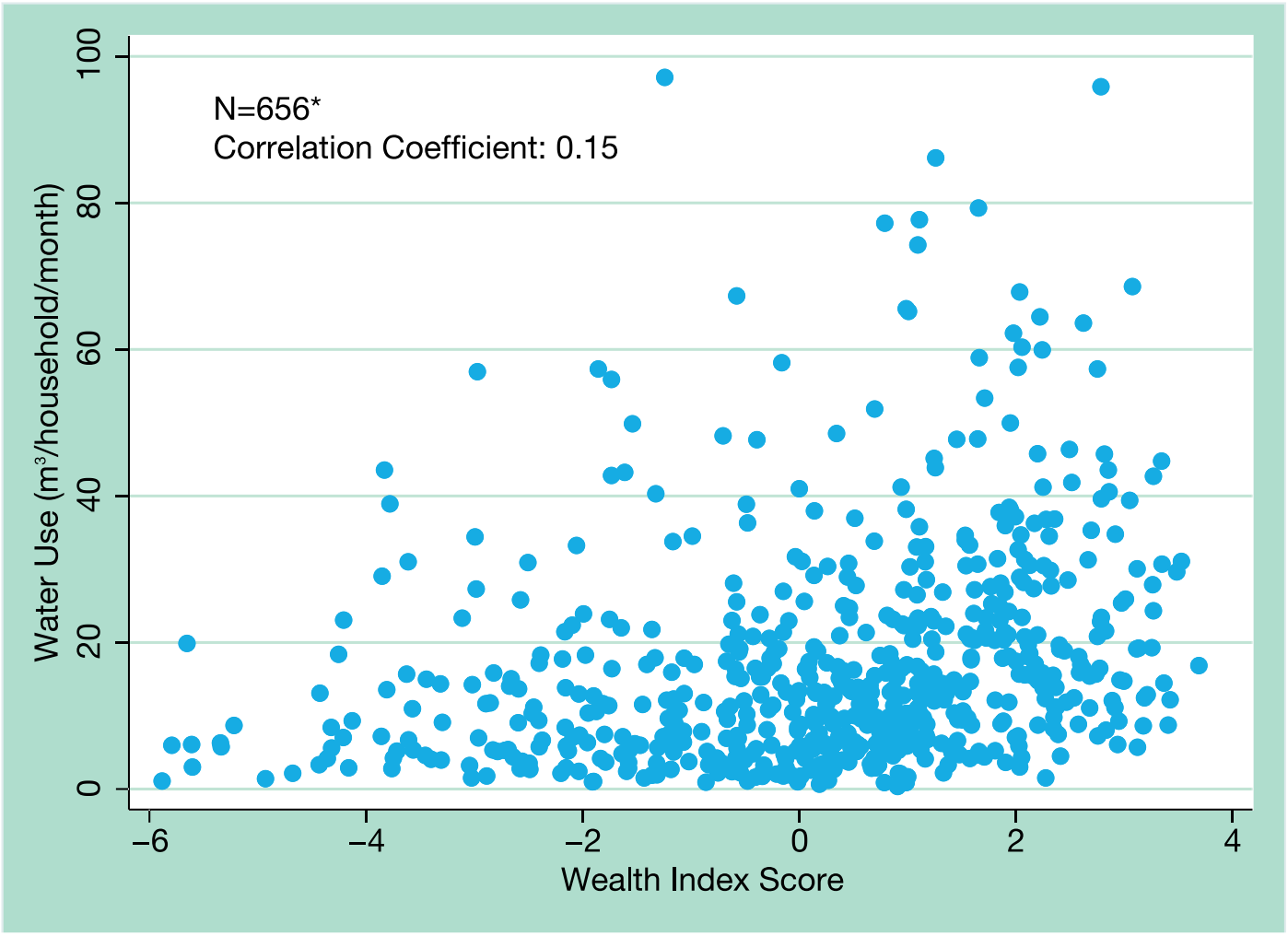
Table 2 presents the correlation between household income and water use in cities in four countries: Sri Lanka, El Salvador, Senegal, and Kenya. As shown in Table 2 and for Nairobi in Figure 2, the correlation is quite low.

In developed countries, data suggest that outside water use is correlated with income, but there are many exceptions. It is not uncommon that wealthy people in

Table 2 Correlation coefficients between household water use and income in four studies

Location	Study	No. households surveyed	Correlation coefficient	Spearman's rank correlation
Sri Lanka (3 cities)	Nauges and van den Berg (2009)	**590**	**0.22**	**0.28**
El Salvador (3 cities)	Strand and Walker (2003)	**398**	**0.08**	**0.13**
Dakar, Senegal	Briand et al. (2010)	**112**	**0.23**	**0.24**
Nairobi, Kenya	Fuente et al. (2016)	**656**	**0.1514**	**0.34**

Figure 2 Scatter plot of monthly household water use versus wealth in Nairobi (*Nine observations with water use above 100 m³/month are not shown on the graph for scale purposes)



Source: Fuente et al. (2016).

both low-income and high-income countries live in apartments without a garden, and use little water outside.

7 Household size and income

Another factor to be considered is the relationship between the number of people living in a household and household income. Unless there is a very strong positive correlation between household income and household size, then this observation alone may be sufficient to conclude that IBT regimes are not an effective way to assist poor people. We suspect that many water utilities would be surprised by the results from the collection of objective data on the relationship between household size and income and how these relationships affect household water use.

Arbon et al. (2014) found that water use is strongly positively correlated with the number of people living in a house but per capita use decreases as household size increases. In some cultures, most households are of a similar size. In other cultures, household size varies considerably.

8 Ensuring access for all

The main conclusion that this paper reaches is that IBTs fail the most basic of inclusive development tests. All

information that we can find suggests that the pricing regimes poorly target subsidies and diminish the pool of funds available for both the provision of water services and other worthwhile government activities (Nauges and Whittington, 2016).

The alternative approach is to decouple the budget and administrative processes used to charge for piped water and sanitation services from the provision of financial assistance and opportunity to disadvantaged people. If this is done, then clear signals about the economic value of water are sent to all and those who need financial assistance can be given that assistance directly at less cost.

Conceptually, there are two ways decoupled water pricing regimes can be administered. The first option is for a water utility to place a tax on all water sales and then rebate the resultant revenue to disadvantaged households. The second alternative, which we think preferable, is to pass this function to a government entity better suited for this purpose.

In the past, the main objection to this proposed decoupled approach has been that in many low-income countries, governments find it difficult to implement means-tested subsidy programmes. Information technology and the big data revolution, however, are making this objection increasingly unpersuasive. The information needed to identify poor households is increasingly available to any government entity that wants to find it. The strong positive correlation between cell phone expenditures and household wealth suggests that cell phone data from telecommunications firms are one good place to look (Blumenstock et al., 2015; Glazer et al., 2015).

9 Financing full coverage

A final consideration is the effect of IBTs on revenue sufficiency. Most IBT regimes charge less than the full cost of water supply even for the most expensive block. When this is the case, utilities are dependent upon access to money transferred to them via government budgeting processes and/or grants from donors. As a general rule, pricing regimes that expose water utilities to the vagaries of government processes tend to compromise each utility's ability to maintain infrastructure adequately and provide full coverage.

Separation of the mechanisms used to ensure affordability from the mechanisms used to recover costs enables both objectives to be achieved in a dynamically efficient manner.

10 Transitioning

We understand that there is widespread public support for and interest in IBTs and that this encourages policy in the opposite direction to the one we recommend. We think that this is partly because of a broad set of public misunderstandings. If this is the case, then, arguably, the first step in beginning a transformation to the improved delivery of water services is to collect the data needed to convince civil society leaders and policymakers that IBTs need to be phased out. To this end and as well as collecting the necessary data, utilities and civil society need to encourage disadvantaged households to argue and petition for change as they are the ones that can expect to gain most from the decoupling of financial assistance from water pricing regimes.

Box 2 Steps for the phase-out of an IBT

Phase 1: Establish the ability to implement a sound pricing policy

1. Collect and share information about who wins and loses from the existing tariff regime.
2. Develop a strong case for and public understanding of the case for change.
3. Fix broken meters, reduce leakage, and generally bring integrity to water service provision.
4. Install meters on all private connections.
5. Establish a programme to finance household connection charges.

Phase 2: Establish a transition pathway to a tariff that balances cost recovery, economic efficiency, and equity/fairness objectives

1. Establish an independent regulator, if one does not already exist, and strengthen their understanding of water charging regimes.
2. Begin offering means-tested financial assistance to poor households.
3. Announce the intention to move to a single-tariff system decoupled from the provision of assistance to disadvantaged households.
4. Begin charging industrial water users the full cost of supply and wastewater collection and treatment.
5. Eliminate the discrepancy between industrial and residential water tariffs.
6. Discontinue the use of IBTs.
7. Demonstrably improve the quality of service provision.
8. Set volumetric tariff equal to the marginal cost of service provision.

Box 2 sets out a series of steps that could be considered a checklist for the phase-out of an IBT. The first phase involves preparation for and development of the institutional conditions that enable change. The second phase involves transition to a new pricing regime.

11 A way forward

The message embedded in this paper is simple. IBTs are hampering not assisting progress in the pursuit of commonly held water and sanitation objectives. If unbundled approaches to the provision of financial assistance to poor households and recovery of water and sanitation service costs are used, much clearer signals about the economic value of water would be given to all, and water utilities could plan with greater certainty and provide full coverage. Poor households would be made better off.

In closing, we recognise that the message in this paper is counter-intuitive and against the tide of public opinion. In countries like Ireland, people are marching in the streets protesting against changes that have been made to water charging regimes.[9] In other parts of the world, however, progress is being made. Careful attention to the message and ways to communicate it are needed. The way forward is to begin by collecting data at the local level on the relationship between household income and water use and then carefully starting a discussion about the best way to ensure full coverage, efficient service delivery, and affordability.

In the long run, and as it now is with most electricity provision, it is the business of water utilities to supply water services to all as efficiently as possible. In many cities, it is time to explore the benefits of shifting responsibility for ensuring that people can afford to pay for access to water to agencies that specialise in the provision of financial assistance to poor and disadvantaged people.

[9] See for example http://www.thejournal.ie/water-protests-2-2564346-Jan2016/

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